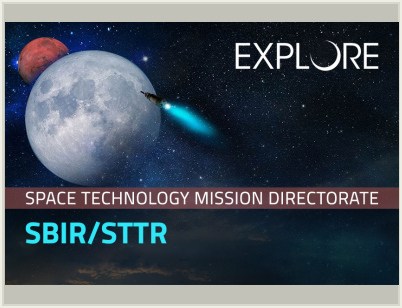
Wireless SAW Sensor Strain Gauge & Integrated Interrogator Design, Phase II

Completed Technology Project (2012 - 2014)

Project Introduction

The proposed Wireless, passive, SAW sensor system operates in a multi-sensor environment with a range in excess of 45 feet. This proposed system offers unique features in two (2) important areas. The first is in the development of a new sensor type, a strain gauge that is based on OFC techniques and implemented with the low loss characteristics of SAW Unidirectional transducers. The second is in the design of an integrated interrogator system that has DSP-based embedded signal processing. Interrogator will also be capable of rapidly performing multiple interrogations which can them be used to make ibration measurements or averaged to extend the operational range of the system. This proposal extends the Phase I and previous work in two major areas; developing a SAW strain sensor, and dramatically increasing interrogation range, which is applicable to both the new strain sensors and the previously developed temperature sensors. In order to increase SAW sensor range, sensitivity and accuracy, the most important device parameters were identified and initial investigation begun in Phase I and will be put into practice in Phase II. To reduce SAW sensor loss and minimize multi-transit acoustic echoes, low loss unidirectional studies were initiated. Phase I produced three alternative low-loss approaches that will be evaluated in the Phase II work. Success will lower the insertion loss by approximately 15 dB, and multi-transit echoes are predicted to be less than -40 dB from the main signal; doubling the system range and reducing the sensors self-noise. Advanced coding techniques were investigated in Phase I that have led to longer delay path lengths, and shorter codes with less inter-sensor interference. During Phase II, the interrogator will improve the following critical capabilities: onboard-fully-integrated DSP, extended connectivity options to customer's computer, and rapid interrogation capabilities. This will allow vibration sensing and signal integration.



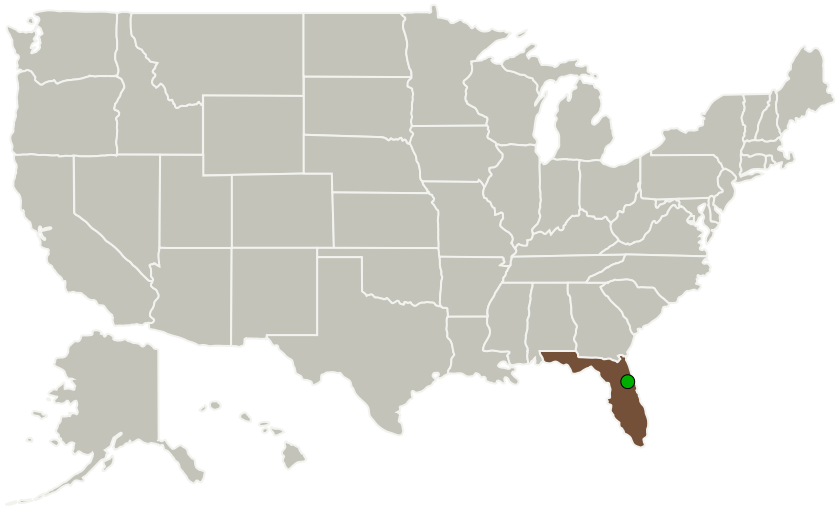
Wireless SAW Sensor Strain Gauge & Integrated Interrogator Design, Phase II

Table of Contents

Wireless SAW Sensor Strain Gauge & Integrated Interrogator Design, Phase II

Completed Technology Project (2012 - 2014)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Mnemonics, Inc.	Lead Organization	Industry	Melbourne, Florida
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

Primary U.S. Work Locations
Florida

Project Transitions

June 2012: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Mnemonics, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

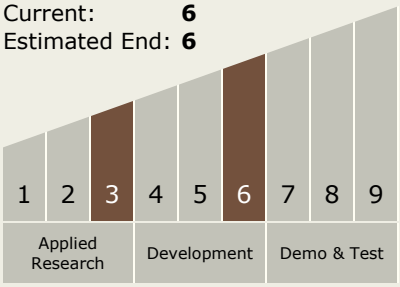
Carlos Torrez

Principal Investigator:

Michael P Keefe

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Wireless SAW Sensor Strain Gauge & Integrated Interrogator Design, Phase II

Completed Technology Project (2012 - 2014)

June 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138575)*

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.4 Reliability, Life Assessment, and Health Monitoring

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System